

## PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference E054226-FC	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/IT 03/00579	International filing date (day/month/year) 29.09.2003	Priority date (day/month/year) 07.07.2003
International Patent Classification (IPC) or both national classification and IPC B22D18/04		
Applicant MECCANICA BASSI S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the opinion
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand  16.12.2004	Date of completion of this report  17.10.2005
Name and mailing address of the International preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Kellner, M  Telephone No. +49 89 2399-2917



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IT 03/00579

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-39 as originally filed

**Claims, Numbers**

1-23 filed with telefax on 11.07.2005

**Drawings, Sheets**

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: ., which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IT 03/00579

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

the entire international application,

claims Nos. 5-17,23

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

**see separate sheet**

the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

the written form has not been furnished or does not comply with the Standard.

the computer readable form has not been furnished or does not comply with the Standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N) Yes: Claims 1-23

No: Claims

Inventive step (IS) Yes: Claims 22

No: Claims 1-4,18-21

Industrial applicability (IA) Yes: Claims 1-23

No: Claims

**2. Citations and explanations**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IT 03/00579

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**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IT 03/00579

1. The amended claims meet the requirements of novelty and industrial applicability of Article 33(2) and (4) PCT are met.
2. The amended independent claims now make clear that the closest state of the art is indeed US-3 874 440-A (D4). This document teaches low pressure casting from below the mould and mentions (see column 4, lines 44-51) various head volumes. These cannot be verified in the figures but are present at the mould. However, as the heads are not defined it must be assumed that they only carry out the minimal function of collecting slag and gases from the melt as well as feeding still molten metal to compensate for shrinkage. They would not present any particular shape, size or additional features.
  - 2.a Hence, the use of means to close off the risers by means of a vacuum plate or similar with filter preventing the expulsion of melt is novel over D4.

However, the procedure according to the independent claim 1 mentions in its last paragraph structural features with no teaching in respect of the procedure. The technical features mentioned do not define the procedure to be carried out and therefore, the subject matter of this claim lacks apparently essential features of the inventive method. Accordingly, claim 1 does not meet the requirement of clarity of Article 84 EPC.
- 2.b The further features of dependent claims 2-4 is generally known to the person skilled in casting metals and ejector pins are known from D4.
3. The casting machine according to the independent claim 5 is novel over the available prior art but it does not mention any filter in the risers or runners. Hence, the claim is presently not so linked to claim 1 as to realize a single inventive idea.
  - 3.a The claims 6-17 depending from claim 5 likewise concern structural parts of the casting machine other than those relating to the filtering capacity.
4. The objection for lack of unity of invention is raised mutatis mutandis with respect to the independent claim 18 mentioning features of a mould with risers and feeders. However, since filtering means are lacking the claim does not concern the idea

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IT 03/00579

realized with the method of claim 1. The necessary filtering means are mentioned in dependent claim 21.

- 4.a The further features of the dependent claims 19 and 20 are generally known in the art of assembling a cope and a drag to form a mould.
5. The independent claim 22 relates to a mould. The mould consists of a drag and a cope and the cope presents channels for evacuation of gases from the mould cavity in use. These features are common with the casting machine taught in D4 and should be found in the preamble of an independent claim. The remaining features relating to a vacuum chamber and filters in the vacuum channels are novel over D4. At present it is not considered obvious to locate such filters in the channels preventing the passage of molten metal during evacuation of gases from the mould cavity. The subject matter of this claim relates to the same inventive idea as claim 1. Hence, these claims are so linked as required in the PCT.
- 5.a Claim 23 presently refers to parts of the casting machine not mentioned in claim 22 and this dependency does not meet the requirement of clarity of Article 6 PCT.

11. LUG. 2005 18:38

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 12

CLAIMS (once amended)

1. Casting procedure, particularly for engine cylinder heads, comprising the steps of:

5 -providing for a mold having open feeding risers for feeding the casting as the cooled metal shrinks and for attracting any slag, fumes and gases contained in the molten metal;

10 -forcing molten metal to flow into the mold from a furnace situated below said mold by exerting a pressure on the surface of said molten metal; and

15 -sealing the top of the mold, at least at the level of the open risers, using a plate which prevent the molten metal introduced under pressure from overflowing and which is connected to a vacuum device for vacuuming fumes and gases.

2. Casting procedure in accordance with claim 1, in which the expulsion of the casting from the mold takes place below it.

20 3. Casting procedure in accordance with claim 2, in which at least the upper part of the figure of the casting is obtained using cores.

25 4. Casting procedure in accordance with claim 2, in which at least the upper part of the figure of the casting is obtained using a metal cope.

11. LUG. 2005 18:39

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 13

5.Casting machine for receiving a a mold, where the mold  
is equipped with a bottom and an ejector plate extending  
downwards from said bottom, the casting machinecomprising  
a lower main structure (30) suitable for housing a  
5 holding or maintenance furnace (32) for feeding the mold  
in a low-pressure casting procedure or in a casting  
procedure according to any one of the preceeding claims,  
an upper main structure (31) resting on said lower  
structure, a base plate (29) resting on the upper main  
10 structure (31), a cooled plate (16) positioned on the  
base plate (19) and suitable for receiving the bottom  
(35) of the mold, characterised in that it further  
comprises, underneath the cooled plate (16), a plate  
holder (17) to be fastened to the ejectors plate of the  
15 mold and running vertically between an inactive lowered  
position and a raised casting expulsion position.

6.Casting machine according to claim 5, wherein the  
cooled plate (16) is fitted with an opening (16') for  
passage of the ejectors plate (38).

20 7.Casting machine according to claims 6 , comprising  
quick lock means for fastening together the ejectors  
plate (38) of the mold and the plate holder (17) of the  
casting machine.

8.Casting machine according to claim 7, in which the  
25 mold ejectors plate has a pair of mushrooms (39) and in

11.LUG. 2005 18:39

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 14

## 3

which the plate holder of the machine is provided with a slide (19) which runs along the plate holder and has slots adapted to receive the mushrooms and to lock them in place following the movement of the slide controlled by a hydraulic cylinder (21).

9.Casting machine according to anyone of the claims from 5 to 8 , especially for engine cylinders heads, destined to receive a mold with two sides, comprising two sides carriers (1) which are fixed to the corresponding side of the mold and slide along guide columns (5) and sliding gibs (20) fitted to the machine for a movement of the slides by hydraulic cylinders (4).

10.Casting machine according to claim 9 , in which the sides are fastened to the sides carriers by automatic quick locking devices.

11.Casting machine according to claim 10 , in which every sides carriers has a slide (24) with slots to receive a pair of mushrooms which protrude from the side of the mold and lock them in place following the movement of the slide controlled by a hydraulic cylinder (25).

12.Casting machine according to claim 10 or 11, , in which the sides carriers (1) are hinged to the sides of the machine , making it possible to rotate then upwards by means of oscillating hydraulic cylinders (7) fitted to

11. LUG. 2005 18:39

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 15

## 4

the machine to enable easy cleaning and repainting of the figure parts of the sides of the molds.

13. Casting machine according to any of the claims from 5 to 12, in which at least one side of the mold is made in at least two overlapping parts and in which the related side carrier is made up of at least two corresponding parts, each of which is moved by a hydraulic cylinder (4), said hydraulic cylinder being controllable independently or in parallel.

10 14. Casting machine, especially for engine cylinders heads, with a tilting arm (8) hinged to the top, destined for the movement of a metal male for low-pressure casting or a casting according to claim 1 to 5, and/or for the movement of sealing means for the upper part of a 15 mold positioned on the machine, depending on the casting process used.

15. Casting machine according to claim 14, in which the metal male and/or the sealing means of the upper part of the mold are attached to a hydraulic cylinder (10) 20 carried by the tilting arm for their vertical movement.

16. Casting machine according to claim 14 or 15, in which, during the casting process, the tilting arm is closed on the bench and locked to the latter from the opposite side compared with the hinged side by a locking 25 device, such as a jack (28').

11. LUG. 2005 18:39

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 16

## 5

17.Casting machine according to any of the claims from 5  
to 16 , wherein the main lower structure (30) is  
removable from the upper structure (31) for placing said  
upper structure on a carrousel or on the ground for a  
5 gravity casting procedure. e

18.Mold for obtaining castings, especially engine  
cylinders heads, comprising a bottom (35) and an upper  
part obtained through cores or a metal male ,  
10 characterized by the fact that said bottom is provided  
with inlets (36) for coupling to pipes from a furnace  
placed underneath the mold and containing the molten  
metal and by the fact that in said cores or in said  
metal male open feeding risers are provided for feeding  
15 the casting as the cooled metal shrinks and for  
attracting any slag, fumes and gases contained in the  
molten metal.

19.Mold according to claim 18 , in which the upper part  
of the figure is obtained by cores, comprising a plate  
20 (45) destined to be pressed, during the casting phase,  
onto the upper surface of the mold to prevent the molten  
metal from overflowing through the risers.

20.Mold according to claim 18 , in which the upper part  
of the figure is obtained by the metal male (51) and in  
25 which the male is fastened to a plate (45') destined to

11. LUG. 2005 18:40

JACOBACCI &amp; PARTNERS 02 76022555

NR. 4402 P. 17

## 6

be pressed, during the casting phase, onto the upper surface of the mold to prevent the molten metal from overflowing through the risers.

21. Mold according to claim 19 or 20, 2 in which the plate is crossed by channels for the vacuuming of fumes and gases from the mold and is fastened to a support (46) in which there is a vacuum chamber (46") communicating with an external vacuum device, said plate's vacuum channels being provided with filters to prevent the passage of molten metal.

22. Mold for obtaining castings, especially engine cylinders heads, using a low-pressure casting procedure, where the upper part of the figure is defined by a metal male (52), characterized by the fact that said metal male is crossed by channels (52') for the vacuuming of fumes and gases from the mold and is fastened to a support (46) in which there is a vacuum chamber (46") communicating with an external vacuum device, said metal male's vacuum channels being provided with filters to prevent the passage of molten metal.

23. Mold according to any of the claims from 19 to 22, , in which only the plate or the support with the vacuum chamber are jointed to the hydraulic cylinder (10) carried by the tilting arm (8) on the casting machine according to any of the claims from 14 to 17 .